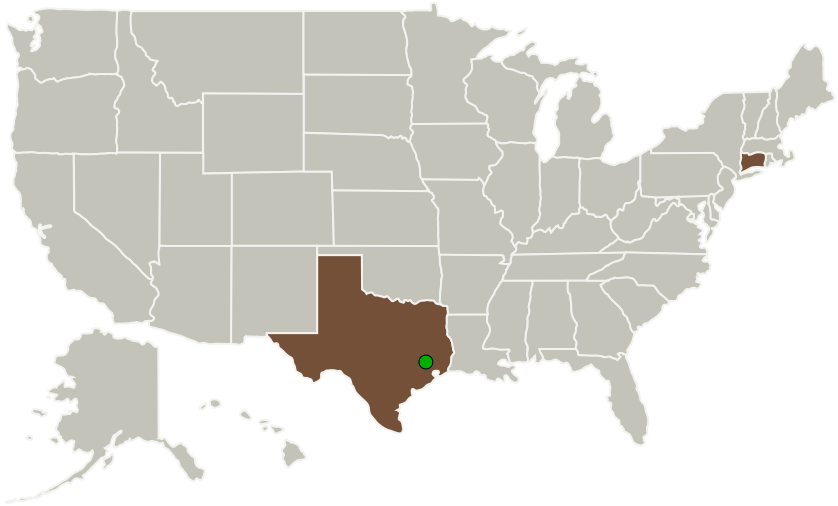
Regenerable Sorbent for Combined CO2, Water, and Trace-Contaminant Capture in the Primary Life Support System (PLSS), Phase II

Completed Technology Project (2014 - 2016)

Project Introduction

The NASA objective of expanding the human experience into the far reaches of space requires the development of regenerable life support systems. This proposal addresses the development of an integrated air-revitalization system for the space suit used in Extravehicular Activities (EVAs). The proposed innovations are: (1) a single CO2, trace-contaminant, and H2O management unit; (2) a single sorbent possessing the capability to remove CO2, trace contaminants, and H2O; (3) monolithic sorption unit to provide the following functions: (a) CO2 sorbent; (b) trace-contaminant sorbent; (c) H2O sorbent; (d) low pressure drop; (e) good thermal management (heat transfer and low heat of adsorption); (f) resistance to dusty environments; and (4) regenerable operation. The overall objective is to develop a CO2/trace-contaminant/H2O removal system that is regenerable and that possesses weight, size, and power-requirement advantages over the current state of the art. The Phase 1 objectives were: (1) to demonstrate the technical feasibility of using a novel CO2 sorbent; and (2) to demonstrate effective CO2, ammonia, and H2O sorption and regeneration. These objectives were successfully accomplished. The Phase II objectives are to optimize sorbent properties and performance, to design, construct, and test a prototype, and to provide guidelines for the integration of the proposed concept with the PLSS. This will be accomplished in the following tasks: (1) Sorbent Development and Optimization; (2) Testing in Subscale Systems at Hamilton Sundstrand; (3) Prototype Design; (4) Prototype Construction; (5) Prototype Testing; and (6) System Evaluation.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Advanced Fuel Research, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Continued on following page.

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Organizations Performing Work	Role	Type	Location
Advanced Fuel Research, Inc.	Lead Organization	Industry	East Hartford, Connecticut
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Connecticut	Texas

Project Transitions

April 2014: Project Start

October 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137602)*

Images

Briefing Chart Image
Regenerable Sorbent for Combined CO2, Water, and Trace-Contaminant Capture in the Primary Life Support System (PLSS), Phase II
(https://techport.nasa.gov/image/132772)

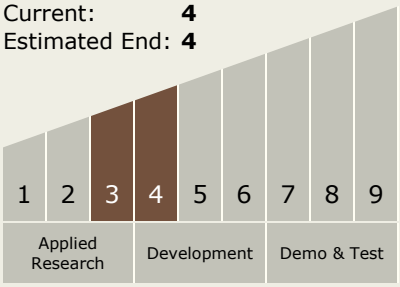
Final Summary Chart Image
Regenerable Sorbent for Combined CO2, Water, and Trace-Contaminant Capture in the Primary Life Support System (PLSS), Phase II Project Image
(https://techport.nasa.gov/image/135736)

Project Management *(cont.)*

Principal Investigator:
Marek Wojtowicz

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.2 Mobility
    - TX04.2.1 Below-Surface Mobility

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System